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CITY OF BOSTON.



REPORT OF THE MYSTIC WATER BOARD, ON AN ORDER OF THE CITY COUNCIL RELATING TO SEWERAGE.









Mystic Water Works

Plan showing the Location of the Line
of a
Proposed Sewer for the Draining of
Tanneries &c in Winchendon, Woburn and
Stoneham
To accompany the Estimate of cost of the same

by
Thomas Doane Civil Engineer
Charlestown, Oct. 5th 1884.

Scale 1000 ft to an inch.

Thomas Doane



CITY OF BOSTON.

OFFICE OF THE MYSTIC WATER BOARD,
BOSTON, October 28th, 1874.

To the City Council of the City of Boston:—

In compliance with an order of the City Council, approved by the Mayor, June 19, 1874, requesting the Mystic Water Board to "prepare and submit an estimate of the expense of constructing a sewer for the purpose of carrying away the impurities which now discharge into Mystic pond from the towns of Winchester and Woburn and certain tanneries and other manufactories," the Board have taken action, and respectfully ask leave to state,—

That very soon after the passage of the order, they employed Mr. Thomas Doane, a civil engineer of unquestioned reputation and ability, to make the necessary observations and surveys, and to prepare an estimate of the cost of a sewer of sufficient capacity to take away the impurities which are now discharged from the places named in the order, into streams which find their way into the Mystic pond. Mr. Doane has been carefully over the ground, has made the surveys and estimates, and we present the result of his labors in his own report, hereto annexed. The estimate is for the construction of sewers for a length of 79,983 feet, at a cost of \$160,000. The surveys have been carefully made, the sewers all actually located upon the ground, and the size of each is believed to be equal to the need in each case, and the Board are of opinion that with the present prices of materials and labor the work can be done for the

sum named. What proportion of the expense of constructing the sewers, or what amount should be paid for the right to enter them after they are built, by the owners of manufactories or dwellings who are now, it is believed, unlawfully draining into the tributary streams of Mystic pond, is a question which the Board cannot answer, and which will perhaps require legal action to determine; but it seems reasonable only to suppose that a share of the cost should be borne by these parties. If a system of sewerage for the towns of Woburn, Winchester and Medford was to be adopted and paid for, as it should be, by the places benefited, it would be requisite to do the work on a larger scale and at a greatly increased cost; but it is believed that the object contemplated in the order of the City Council, the carrying away of impurities which now discharge into streams connected with Mystic pond, can be effectually accomplished by the construction of the sewers proposed in the report of Mr. Doane; and for the reasons stated by Mr. Doane in his report, the Board are of the opinion that there is but little liability of any increase in the kind of manufacturing, which is so objectionable and troublesome along the course of these streams.

For the Mystic Water Board,

TIMOTHY T. SAWYER,

President.

CHARLESTOWN, Oct. 7th, 1874.

To the Mystic Water Board,

HON. T. T. SAWYER, President: —

At your request I have made, as I suppose, the necessary examinations, surveys and estimates, contemplated in the order of the City Government of Boston, dated June 19th, 1874, which is in the following words so far as it relates to the subject of the order: "An estimate of the expense of constructing a sewer for the purpose of carrying away the

impurities which now discharge into Mystic pond from the towns of Winchester and Woburn, and certain tanneries and other manufactories."

I have now the honor to submit the following statement, which may perhaps aid you in making up your report to the City Council:

I have not thought the wording of the aforesaid order broad enough to cover more than a purpose to take away the impure waters which *now* discharge into Mystic pond, and therefore have not touched upon the matter of the general sewerage of the two towns named.

Should it, however, be deemed best to look into this matter, I think the locations of the lines of sewers already made will be found very nearly right for the thorough drainage of these towns.

The following is a list of the principal sources from which impurities are now discharged into Mystic pond:—

CUMMINGSVILLE IN WOBURN.

Bishop & Co.'s Tannery.

Cummings & Co.'s Tannery.

TOWN MEADOWS IN WOBURN.

Kinney's Tannery.

Fifty dwelling-houses upon Town Meadows.

Dow & Co.'s Tannery.

RUSSELL BROOK.

Winn's Tannery.

Murphy & Plummer's Tanery.

Trowan's Tannery.

Linnell, Houston & Co.'s Tan-

Skinner & Co.'s Tannery.

nery.

Pollard & Co.'s Tannery.

Bryan's Tannery,

Blake, Hinckley & Co.'s Tan-

Eustis Cummings & Co.'s Tan-

nery,

Shaw & Taylor's Tannery.

Crane's Tannery.

Thompson's Tannery.

And 100 dwelling-houses situated near the brook, and Conn's Tannery.

The drainage from the gas works is very slight, and only when making gas, which is principally in the night, when the sewers will not be in use by the tanneries.

ABAJONNA RIVER.

Frye & Thompson's Tannery.

Maxwell & Sons' Tannery.

Moseley's Tannery.

STONEHAM BRANCH.

Dyke's Tannery in Stoneham Village.

The Glue Works in East Woburn.

WINCHESTER VILLAGE.

Batchelder & Furbush's Tannery.

Waldmeyer's Tannery.

61 dwelling-houses now draining into Wedge pond and the Mill pond.

Bacon's Felting Factory.

Some of the brooks which now drain away the impure waters from the tanneries might apparently with propriety be taken wholly into the sewers; but it is important to save to the pond the natural drainage, and the storm-waters of the considerable areas tributary to these filthy streams, and not to waste them through the sewers. And, further, if provision were made in the sewers to take away the storm-waters discharged through these streams, they must be made very much larger and more expensive than if intended only for the regular discharges from the tanneries.

Lines of sewers have therefore been run to all the sources of impure water, and no reliance is placed upon natural water-courses.

There are a very few manufactories at North Woburn which discharge impure waters, but as with one exception

they are currying establishments which use very little water, and are very remote from Mystic pond, no sewers have been run to them.

QUANTITIES OF IMPURE WATER.

The maximum estimate of water used in tanning a hide, or two sides, is 500 gallons. Probably 100 gallons of this water is used in boilers, and evaporated from hides drying upon the racks; 400 gallons will then be the amount per hide of impure water discharged, and for which provision must be made in the sewers. By ascertaining the number of hides tanned by each establishment, and multiplying by 400, we get nearly the maximum quantity of water which is taken to be uniformly discharged through a period of 10 hours.

The quantities discharged from other establishments than tanneries have been estimated from the means at hand, such as measuring tanks and ascertaining how many times full per day they were used, or by measuring the delivery of pumps.

The quantities of water discharged from dwelling-houses is estimated at 60 gallons per day to each of eight persons to each house.

When it has been possible to compare the quantities obtained as above, with the flowage in the brooks, there has been found a very close agreement.

The quantities thus found, and for which provision must be made in the sewers, are as follows:—

From Cummingsville	98,800	galls. per day.
From town meadows	86,800	" "
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Or a total for the Cummingsville branch	185,600	" "
From Russell brook	373,900	" "
From the Abajonna branch, includ- ing that from Stoneham	198,400	" "
From all the above and from Win- chester village a total for the main sewer is found of	843,510	" "

To provide for every emergency, the above quantities have been doubled in estimating the size of sewers when running full.

There is probably not to be an increase in this kind of manufacturing in this vicinity, as the lands and waters are becoming too valuable, the hides and bark too distant, and the accumulating population too restive under the necessary pollution of air and water to permit it.

For all sewers of 12 inches diameter or under, earthen pipe have been estimated for, while all over 12 inches are intended to be in brick, which now is cheaper.

In making up the estimates, nothing has been included for bringing the sewage to the main lines from the houses and tanneries. This must be left for individual and town action.

Within the limits of Woburn all the houses, the drainage of which is herein estimated for, are at a sufficient elevation, I think, to drain into the sewers. In the village of Winchester the 61 houses which now drain into the waters of Mystic pond cannot all drain from a lower point than the tops of their cellars; but if all sewage is thus discharged, the cellar drainage is less objectionable, and even this evil would be almost entirely remedied by taking away Whitney's dam, and filling up the entire area occupied by the ponds, except a passage for the Abajonna river and the outlet of Horn and Wedge ponds.

The estimates include a catch-pit for each manufacturing establishment and tannery, and also for each junction of sewers. Those put into the main sewer of 2.25 feet diameter are 5.50 feet long and 4.50 feet wide inside; and those in the smaller sewers are 4.50 feet long and 3.50 feet wide, and their flows are all at a level of three feet below the bottom of the outlet sewer. These pits should be provided with spouts to carry the running water around while the solid accumulations are being removed from them.

The tanneries, in many cases, discharge their waters after use into the water-courses at very nearly their surface level. It will, therefore, be almost impossible to place the sewers low enough in the ground to take the discharges from all the tanneries by gravity, without submerging them at excessive cost. This will necessitate the remodelling, to a small extent, of some of the tanneries, or the pumping of the sewage into the catch-pits.

LOCATION OF SEWERS.

The Mystic water basin, in its present condition, and in view of the changes proposed in it, is most unfortunately situated for drainage.

The upper Mystic pond is now raised to such a level as to flow back up the Abajonna river to Whitney's dam at Winchester village. It is now proposed to raise the lower pond to the same level.

It is also proposed to make one or more extensive storage basins on the Abajonna river, near East Woburn, and another above Horn pond, which will flow back to Cummingsville.

As it is a necessity to provide storage for water here, if the Mystic water works are to be made the most of, I have thought it imperative to locate the sewers outside of all these basins.

The outlet of the main sewer is placed at Mystic river, near the point where the Mystic water-pipes pass under the river. The line is then run for grade, as it is called; that is, placed in such a position as to secure uniformity of grade and uniformity of depth in the ground. This makes the sewer in some portions quite sinuous.

The line, after crossing High street in Medford, runs through the land of Mr. Brooks to the easterly margin of the proposed lower pond and along it and the present upper pond to the Medford and Winchester town line. Near this point it leaves the pond, and is laid in the bed of the abandoned

Middlesex canal, until it strikes the westerly line of the Boston & Lowell Railroad, which it follows to Winchester village, crossing the Abajonna river near where the railroad crosses it, and encroaching upon the right of way of the railroad at its Winchester engine-house, in order to pass through and around a heavy ledge.

Thence it runs through the public square, and along Main street and under the Woburn Branch Railroad, to a point near Moseley's tannery, where it receives the lines coming from Russell brook and down the Abajonna valley.

The Cummingsville branch joins the above main line in Main street and follows along the northeasterly side of Wedge pond, Horn pond outlet, Horn pond as raised, and the proposed storage basin to Bishop's tannery.

The Russell's brook branch joins the main sewer near Moseley's tannery, and follows along the northeasterly side of the Woburn Branch Railroad, within its right of way, up to Woburn village, and thence by streets and over private lands, near Russell brook, to Salem street.

The Abajonna branch begins at the main sewer near Moseley's and extends along the westerly side of the Abajonna river and its two proposed storage basins, to a point opposite Frye & Thompson's tannery.

The Stoneham branch leaves the Abajonna branch sewer below the storage basins proposed, crosses the Abajonna river, passes by and below the new glue works, and over private lands, till it strikes the street near the Stoneham cemetery, whence it runs in streets to Dyke's tannery in Stoneham village.

GRADES.

The peculiar location of the sewers for such long distances by the side of level waters involves grades of slight inclination. None, however, is less than 6 in 10,000. It is believed the velocities due to this inclination will carry through every-

thing likely to find its way in except stones and gravel and deposits of lime. At every inlet of impure water there is a catch-pit, and at short intervals below others are placed, so that the heavier portions will early be deposited and generally where they can be removed.

There being but one inlet to the main sewer below Winchester village, it is believed that all the deposits will be made above the village, and that the water of the sewer below will carry very little impurity that is not held in solution.

ESTIMATE OF COST OF SEWERS.

From Mystic river to Moseley's junction.

House over outlet at Mystic river	\$707 00
19,600 lineal feet of brick sewer	
2.25 feet in diam., 1 brick thick, 1,214,220 bricks laid,	
@ \$25 per M.	30,355 50
11 large catch-pits, @ \$125	1,375 00
Bridge at Abajonna river station	
134.90	2,028 00
Bridge at Wedge pond outlet	3,300 00
40,788 cub. yards' excavation and refilling, @ .40	16,315 20
13,028 cubic yards' filling, @ .30	3,908 40
2,190 " " ledge, @ 3.00	6,570 00
8 houses on Main street to be raised, @ \$200	1,600 00
9.8 acres of right of way, 2 rods wide, @ \$200	1,960 00
Extra for going under Woburn Branch Railroad	500 00
<i>Carried forward,</i>	<hr/> \$68,619 10

Brought forward, \$68,619 10

UP THE ABAJONNA.

From Moseley's junction to Stoneham junction.

8,100 feet of brick sewer 1.25 feet diam., 1 brick thick, con- taining 280,665 bricks, laid, @\$25 per M.	\$7,016 62
5 small catch-pits, @ \$100 . . .	500 00
Culvert at sta. 335, 29 yds. @ \$8 . . .	232 00
6,242 cubic yards of excavation and refilling, @ 33 cts.	2,059 86
560 cubic yards of filling, @ 30 cts. . . .	168 00
3 acres of right of way, 1 rod wide, @ \$100	300 00
Extra for going through Lowell Railroad bank	300 00
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	10,576 48

UP THE ABAJONNA.

*From Stoneham junction to Frye & Thomp-
son's tannery.*

4,700 lineal feet 6-inch Scotch pipe, @ 30 cts.	\$1,410 00
Add 2 % for breakage	28 20
Add 20 % for laying	282 00
3 small catch-pits, @ \$100	300 00
2,915 cubic yards' excavating and refilling, @ 33 cts.	961 95
202 cub. yards' filling, @ 30 cents . . .	60 60
1.8 acres of right of way, 1 rod wide, @ \$100	180 00
Extra for going under Stoneham Branch Railroad	50 00
	<hr/>
	3,272 75

Carried forward,

\$82,468 33

Brought forward, \$82,468 33

From Stoneham junction to Stoneham village.

2,300 lineal feet 10-inch Scotch pipe, @ 70 cents	\$1,610 00
Add 2 % for breakage	32 20
Add 20 % for laying	322 00
4,800 lineal feet 6-inch Scotch pipe, Glue Works to Main street, @ 30 cents	1,440 00
Add 2 % for breakage	28 80
Add 20 % for laying	288 00
1,660 lineal feet Scotch pipe 8-inch, Main street to Dyke's, @ 45 cents	720 00
Add 2 % for breakage	14 40
Add 20 % for laying	144 00
5 small catch-pits, @ \$100	500 00
Bridge at Canal station, 670 + 50	892 00
Bridge over Abajonna station 673 + 50	3,236 00
5,386 cubic yards' excavating and refilling, @ 33 cents	1,777 38
4,655 cub. yards' filling, @ 30 cts.	1,396 50
259 cubic yards' rock, @ \$6	1,554 00
2 acres of right of way, 1 rod wide, @ \$100	200 00
Extra for going through Stone- ham Branch Railroad bank	300 00
	14,455 28
<i>Carried forward,</i>	96,923 61

Brought forward, \$96,923 61

RUSSELL BROOK BRANCH.

*From Moseley's junction to Winn's tannery,
Woburn.*

6,100 lineal feet 12-inch Scotch pipe, @ 84 cents	\$5,124 00
Add 2 % for breakage	102 48
Add 20 % for laying	1,024 80
1,250 lineal feet 10-inch Scotch pipe, @ 70 cents	875 00
Add 2 % for breakage	17 50
Add 20 % for laying	175 00
2,200 lineal feet 8-inch Scotch pipe, @ 45 cents	990 00
Add 2 % for breakage	19 80
Add 20 % for laying	198 00
13 small catch-pits, @ \$100	1,300 00
7,054 cub. yards' excavating and refilling, @ 33 cents	2,327 82
2,088 cub. yards' filling, @ 30 cts.	611 40
Bridge over Russell brook, sta- tion 223	438 00
36 acres of right of way, 1 rod wide, @ \$100	360 00
	—
	13,563 80

*From Main street, Winchester, to Eishop's
tannery in Cummingsville.*

16,750 lineal feet 12-inch Scotch pipe, @ 84 cents	\$14,070 00
Add 2 % for breakage	281 40
Add 20 % for laying	2,814 00
1,750 lineal feet 8-inch Scotch pipe, @ 45 cents	787 50
Add 2 % for breakage	15 75
	—
<i>Carried forward,</i>	\$17,968 65
	\$110,487 41

<i>Brought forward,</i>	\$17,968	65	\$110,487	41
Add 20% for laying	157	50		
7 small catch-pits, @ \$100	700	00		
Culvert (2 ft.) at station 491, 18 yards, @ \$8	148	00		
Culvert 5-feet arch at station 534, 88 yards, @ \$10	880	00		
Culvert 4-feet box at station 534, 68 yards, @ \$8	548	00		
Culvert 3-feet box at station 550, 60 yards, @ \$8	480	00		
Culvert 2-feet box at station 561.50, 46 yards, @ \$8	368	00		
8,512 cub. yards' excavating and refilling, @ 33 cents	2,808	96		
7,703 cub. yards' filling, @ 30 cts.	2,310	90		
265 cubic yards' rock, @ \$6	1,590	00		
7 acres of right of way, 1 rod wide, @ \$100	700	00		
			28,660	01

LAKE ST. BRANCH, WINCHESTER.

*From sewer in Main street to Batchelder & Fur-
bush's tannery.*

1,250 lineal feet 6-in. Scotch pipe, @ 30 cts.	\$375	00		
Add 2% for breakage	7	50		
Add 20% for laying	75	00		
1 small catch-pit, @ \$100.	100	00		
12 feet iron pipe in bridge, station 768	20	00		
327 cubic yards' excavating and refilling, @ 33 cts.	107	81		
2,483 cub. yards' filling, @ 30 cts.	744	90		
Extra for crossing bridge	50			
			1,480	21
<i>Carried forward,</i>			\$140,627	63

Brought forward, \$140,627 63
From junction with Abajonna branch to Maxwell's tannery.

743 lineal feet 4-inch Scotch pipe,	
@ 27	\$148 60
Add 2 % for breaking	2 97
Add 20 % for laying	29 70
1 catch-pit, small, @ \$100	100 00
Pipe culvert at station 761, 20 ft.	
12 in.	20 00
310 cubic yards, partly wet, excavating and refilling, @ 50 cts.	155 00
547 cubic yards filling, @ 30 cts.	164 10
Extra for going under Lowell Railroad	100 00
	—
	720 37

From main sewer to Bacon's felting mill.
1,000 lineal feet 6-in. pipe, whole cost estimated at 2,000 00

TOWN MEADOWS BRANCH.

From junction near Dow's tannery through town meadows to Kinney's.

6,540 lineal feet 9-inch Scotch pipe, @ 55 cts.	\$3,597 00
Add 2 % for breakage	71 94
Add 20 % for laying	719 40
3 small catch-pits, @ \$100	300 00
4,428 cub. yards' excavating and refilling, @ 33 cts.	1,461 24
319 cubic yards' filling, @ 30 cts.	95 70
2.3 acres of right of way, 1 rod wide, @ \$100	230 00
	—
	6,475 28

Carried forward, \$149,823 28

Brought forward, \$149,823 28

POLLARD'S BRANCH.

From junction with Russell-brook sewer to
Pollard's tannery.

1,300 lineal feet 4-inch Scotch pipe, @ 20 cts.	\$260 00
Add 2 % for breakage	5 20
Add 20 % for laying	52 00
1 small-catch pit, @ \$100	100 00
623 cubic yards, wet, excavating and refilling, @ 60 cts.	373 80
98 cubic yards' filling, @ 30 cts.	29 40
$\frac{1}{2}$ acre of right of way, 1 rod wide, @ \$100	50 00
Extra for going under Russell brook	50 00
	920 40
Total	\$150,743 68
Engineering, superintendence, etc., say	9,256 32
	\$160,000 00

The total lengths of sewers estimated for above are as follows :—

Mystic river to Moseley's	.	.	.	.	19,600	feet.
Moseley's to Stoneham junction	.	.	.	.	8,100	"
Stoneham junction to Frye and Thompson's	.	.	.	.	4,700	"
Stoneham junction to Stoneham village	.	.	.	.	8,700	"
Moseley's to Winn's tannery	.	.	.	.	9,550	"
Main st., Winchester, to Cummingsville	.	.	.	.	18,500	"
Dow's junction, through town meadows, to Kinney's	.	.	.	.	6,540	"
Pollard's branch	.	.	.	.	1,300	"
Batchelder and Furbush's branch	1,250	"
Maxwell's and Sons' branch	743	"
Bacon's branch	1,000	"
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Total	79,983	"

Equal to 15.15 miles. At a total cost of \$160,000.00 the average estimated cost per foot is \$2.00.

Should the town of Medford oppose or successfully resist the discharge of this sewage into Mystic river above its village, it will require an extension of this sewer, or a contribution towards a still larger one, to be built by the town through a distance of $2\frac{3}{4}$ miles, equal* to 14,520 feet, at a cost of \$3.50 per foot, to discharge at a proper point below the village. This will amount to \$50,820.

I hand you herewith a plan from which you will be able better to understand the locations of the various lines of sewers.

THOMAS DOANE.

